wound stator disclosed in claims 5, 7 and 13, the squirrel cage rotor disclosed in claims 6 and 7, the digital signal processor disclosed in claim 8, the steps of controlling the inverter disclosed in claim 9 and the position sensor connected to the induction machine disclosed in claims 10, 11 and 14 must be shown or the feature(s) canceled from the claim(s).

Applicants submit a new copy of Fig. 8, as suggested by the Examiner, with the various elements labeled with reference numerals to help the Examiner's understanding of these elements. Specifically, applicants respond as follows:

(1) The "stator" is shown in Fig. 8 by the added legend.

(2) The "winding connected to the inverter" is shown in Fig. 8 because the winding is connected to the inverter by the lines shown connecting the induction motor to the inverter.

(3) The "microprocessor connected to the inverter" is shown in Fig. 8 by μP.

(4) The "toroidally wound stator" is shown in Fig. 8 by the added legend.

(5) The "squirrel cage rotor" is shown in Fig. 8 by the added legend.

(6) The "digital signal processor" is shown in Fig. 8 as the DSP.

(7) The "steps of controlling the inverter" was previously amended to "means for controlling the inverter" in the previous amendment and this feature is shown in Fig. 8.

(8) The "position sensor connected to the induction machine" is shown in Fig. 8 by position sensor D which is also labeled the incremental encoder.

Applicants have also amended the specification to list the elements shown in Fig. 8. As discussed at the interview, Fig. 8 includes a programmable microprocessor/digital signal processor DSP (dashed line) operatively connected to the inverter A. The inverter A is shown with nine phases at the output. The induction machine C is shown in this example with nine phases. A position sensor D is also shown connected to the induction machine C. This position sensor D is shown to be an incremental encoder, however, in general, any position sensor known in the art can be used.

In point 2 on page 2 of the office action, the Examiner stated that the drawings were objected to under 37 CFR 1.83(a) because they fail to show the reference numbers in the specification as described in the claims. It is unclear to

applicants how the drawings fail to show the reference numbers in the claims, when no reference numerals are in the claims. Applicants are not sure if this comment is somehow related to points 1 or 3 on page 2 of the office action. Applicant submits that the elements of the claims are shown in the drawings, including proposed drawing change for Fig. 8 and that no additional drawing changes are needed. If applicants' understanding is not correct for this point, the Examiner is respectfully requested to clarify this drawing objection so that applicants can properly respond.

The Examiner also stated that the drawings were objected because in Fig. 8, many of the structure devices were not identified in the specification. As stated above, applicant submits herewith a new proposed drawing change for Fig. 8. Applicant also has amended the specification to list the elements shown in Fig. 8. By this amendment, each box description is included and the reference numerals are described. It is submitted that no new matter is being presented by this amendment. In view of this amendment to Fig. 8 and the amendment to the specification, applicants submit that this drawing objection has been overcome and should be withdrawn.

Claims 1-12 were rejected under 35 USC 112, second paragraph, as being indefinite. Regarding claims 1, 11 and 14, the Examiner asked what specifically are the "means" that control the inverter. In response, the means for controlling the inverter so that said induction machine operates with pole phase modulation is done in the microprocessor or the DSP with the software program as described in the specification. It is submitted that these means are described in the specification and no further amendments of the claims are necessary. If the Examiner believes that a further amendment of the claims is necessary to clarify this point, the Examiner is respectfully requested to suggest additional wording for applicants to consider. It is therefore respectfully submitted that these claims are clear and definite and this rejection should be withdrawn.

Claims 1-4, 6 and 8-10 were rejected under 35 USC 103(a) as being obvious over Le (U.S. Patent No. 5,350,988) in view of Kuznetsov (U.S. Patent No. 4,489,265). The Examiner stated that Le discloses an induction machine with a stator 14 and rotor, stator 14 having a plurality of phase windings A, B, C an inverter 12 with a plurality of switches (see Figure 2) and the inverter being connected to the digital signal processor 70 and

also including a position sensor 16. The Examiner also pointed out that Le does not disclose using means for operating the induction machine in pole phase modulation.

The Examiner believed that Kuznetsov discloses for the purpose of utilizing the entire speed control applications of an induction machine without the necessity for large dead zones, a stator structure 10, which has means for controlling the induction machine pole phase modulation. The Examiner believed that it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Le by using means for controlling pole phase modulation for the purpose of utilizing the entire speed control applications of an induction machine without the necessity for large dead zones as disclosed by Kuznetsov.

This rejection is respectfully traversed in view of the amendments to claim 1 and the comments below and those presented at the interview. As discussed at the interview, the present invention relates to a system comprising an induction machine with a stator and a rotor; an inverter and a programmable microprocessor. The microprocessor (or DSP) includes a means for operating the induction machine using pole phase modulation. The system also includes a position sensor connected to the induction

machine for providing a position indication that is indicative of a relative position of the rotor and the stator. The stator for the induction machine has a plurality of phases.

Le discloses digital control of a Brushless DC Motor (BDCM) that is typically a permanent magnet synchronous machine having distinct, fixed number of permanent magnet poles on the rotor. Le describes control for the brushless motor, as stated in column 1, lines 10-13, lines 66-67 and claims 1 and 14.

In Le, the phase number is restricted to 3, as is typical of the state of the art. Le cannot operate his machine using pole phase modulation.

In the present application, high phase order systems, typically 9, that are amendable to pole-phase-modulation are needed. The purpose of pole-phase modulation is to simultaneously change the number of stator and rotor poles and thereby adjust the machine operating characteristics to the number of stator and rotor poles. This adjusts the machine operating characteristics to the application requirements.

Kuznetsov does not make up for the deficiencies in Le. Kuznetsov describes a cylindrical machine with an axial winding that uses "pole phase modulation" but not as described in the present application. Kuznetsov requires two windings in a

stator: power and control windings, supplied from two different sources. In other words, Kuznetsov requires two separate sources to energize to separate sets of windings.

Kuznetsov does not show any control loops, which would be required to produce characteristics disclosed in the present application. Furthermore, Kuznetsov states in column 2, line 23-24, that "the machine…retains the basic stiffness of torque versus slip…" referring his machine, not to its control characteristics.

Miller et al. (US Patent No. 5,977,679) which was incorporated by reference (as stated on page 7 of the present application), uses only one winding to effect pole change in the machine. Miller et al. deals with a toroidal winding, required to implement pole-phase modulation, as described in that patent.

Each of these two pole-phase modulation methods employs a specific type of the machine which cannot be switched around.

The present application shows, for example, how to control both a motor and a generator in a closed loop, while also controlling the instantaneous torque, by which the generator loads an internal combustion engine (ICE). In this way, the vehicle system control can arbitrate between torque demand from the wheels and the generator, so not to exceed the available

torque from the ICE. Kuznetsov is not capable of providing this control.

Even if Le in combination Kuznetsov was used, this type of system could not be implemented because a conventional permanent magnet machine, such as BDCM, has a predefined, unchangeable number of poles on the rotor. In fact, to attempt to alter the pole number in a BDCM would alter its performance and render it useless because the stator windings would not be compatible with the number of rotor poles. Thus it is submitted that Le, Kuznetsov or any of the other prior art of record does not disclose a system comprising: an induction machine with a stator and a rotor, the stator having a plurality of phase windings; an inverter having a plurality of solid-state switches with appropriate controls and having the same number of phases as the induction machine, the inverter being connected to selectively energize said windings; and a programmable microprocessor operatively connected to the inverter and including a program for controlling the inverter that includes means for operating the induction machine using pole phase modulation.

Claims 5, 7 and 11-14 were rejected under 35 USC 103(a) as being obvious over Le (U.S. Patent No. 5,350,988) in view of Kuznetsov (U.S. Patent No. 4,489,265) and Miller et al. (U.S.

Patent No. 5,977,679). This rejection is respectfully traversed in view of the comments above relating to the unobviousness of combining Le and Kuznetsov. Further, applicants (including Mr. John M. Miller) submit that one of ordinary skill in the art would not have combined Le and Kuznetsov and Miller et al. (Mr. Miller's earlier patent, US Patent No. 5,977,679) to achieve the claimed invention. There is no teaching or suggestion for such a combination. Accordingly this rejection should also be withdrawn.

Therefore, applicants respectfully submit that the application is now in condition for allowance and an action to this effect is respectfully requested.

If there are any questions or concerns regarding this application, the Examiner is requested to telephone the undersigned at the telephone number listed below.

Respectfully submitted,

Date: November 21, 2002

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VERSION WITH MARKING TO SHOW CHANGES MADE

Submitted herewith marked-up version of the amended paragraphs and claims to show the changes made in the foregoing Amendment.

IN THE CLAIMS

Please substitute claim 1 for the pending claim with the same number respectively:

-- 1. (Twice Amended) A system comprising:

an induction machine with a stator and a rotor, said stator having a plurality of phase windings;

an inverter having a plurality of solid-state switches with appropriate controls and having the same number of phases as said induction machine, said inverter being connected to selectively energize said windings; and

a programmable microprocessor operatively connected to said inverter and including a program for controlling said inverter that includes means for operating said induction machine using

pole phase modulation to simultaneously change the number of stator and rotor poles. --